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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/756,814	01/09/2001	Kevin M. Short	9815/55092	6158

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BOSTON, MA 02110-2624

EXAMINER
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TRUONG, THANHNGA B

ART UNIT	PAPER NUMBER
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2135

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/756,814

Applicant(s)

SHORT, KEVIN M.

Examiner

Thanhnga Truong

Art Unit

2135

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

1. Claims 16 and 17 are objected to because of the following informalities:
  - a. Referring to claims 16-17:
    - i. There is no equivalent claim 0 anywhere under the "What is claimed is:" section. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barnsley et al (US 4,941,193), and further in view of Bristol (US 5,774,385) and Boothroyd Chaos Systems: Electronic Applications Reap the Benefits.

- a. Referring to claim 1:
  - i. Barnsley teaches:
    - (1) choosing an image file to be compressed and decomposing it into slices; finding a trend line for each slice and calculating trend line information describing the trend line; calculating for each slice a detrended image slice, by subtracting from each slice its trend line and storing the trend line information describing the trend line; choosing a chaotic system; applying selected digital initialization codes to the chaotic system such that each initialization code produces a periodic orbit and stabilizes the otherwise unstable periodic orbit; generating a basic waveform for each periodic orbit such that the basic waveform is in a one-to-one correspondence to the initialization code for the periodic orbit; selecting basic waveforms to be used with each detrended image slice and storing their corresponding initialization codes; transforming the detrended image slice and the selected basic waveforms to a proper frequency range and storing frequency information describing

the transformation; calculating weighting factors to create a weighted sum of the selected basic waveforms to approximate each detrended image slice and storing the weighting factors; and combining the stored trend line information, the stored initialization codes, the stored frequency information and the stored weighting factors for each detrended image slice to comprise a compressed image file [i.e., the image is basically represented by a matrix of coefficients of affine transformations. The coefficients are then used to recreate the image. In one preferred embodiment, a chaotic dynamical system is set up to utilize the affine coefficients and reproduce an attractor. Because the mathematics provides a compact way to store the characteristics of an object, this approach compresses the content of an exact image into just a few coefficients. The present invention disclosed herein is believed capable of encoding high resolution graphic images exactly (or inexactly, if desired) at compression ratios better than 10,000:1 for some images. The methods can be used with classical compression techniques to increase yields (column 4, lines 58-67 through column 5, lines 1-3). Furthermore, Barnsley teaches the important point is that two closed and bounded sets are more and more nearly the same set the smaller the Hausdorff distance between them. In saying that they are nearly the same, we mean that they look alike at a fixed resolution. stated in yet other words, an acceptable or satisfactory set of IFS codes for a given input image has been found when the Hausdorff distance between the given input image and the image reproduced by decoding a set of IFS codes is a minimum for the resolution of the display screen. It is also considered an advantage provided in the present invention that the IFS representations are stable. The method and means described herein are stable in the sense that small changes in coefficients in the IFS codes correspond to small changes in the decoded data. This robustness is not shared by other commonly used exact compression codes known in the art (column 18, lines 12-29)]. For more details associate with stabilizing of chaotic attractors, see column 5, lines 64-67 through column 6, lines 1-37.

- ii. However, Barnsley does not mention:

(1) about the use of orbits which associates with chaotic attractors.

(2) about the use of the trend line and its calculation.

iii. Boothroyd teaches:

(1) the same basic idea of self-similarity that enables Barnsley and Sloan to manipulate image files (**Barnsley, Column 3, lines 48-55**) also allows Mackenszie and Sandler to manipulate audio files (**see Boothroyd, pages 22 Column 2, last paragraph**).

Bristol teaches:

(2) an apparatus compresses a data stream having a plurality of data samples into a series of best fit trend line segments (**column 4, lines 12-14**). In addition, the compression method executed by the instructions stored in the program memory 36 is identified as a Rolling pivot, Swinging Door, Trend Compression Method. The method operates within the above-described apparatus to receive a digital data stream, compress the digital data stream, and generate an output stream of compressed data. The output stream of compressed data consists of best-fit line segments, identified as trend line segments, which provide an approximation of the input data stream. The Rolling pivot, Swinging Door Trend Compression Method is based on a concept that an approximation of a set of data points can be computed from the data points of a set that constitute only the boundary points (defined as vertex points) of the convex hull of trend data (**column 5, lines 61-67 through column 6, lines 1-7**).

iv. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to:

(1) have applied Barnsley's teachings to the image files of Boothroyd to provide for compression in audio files as well as image files. The same four reasons to obtain compression for image files that Barnsley recites in (**column 1, lines 34-45**) for compression of image files, would be equally valid for image files.

(2) have applied Barnsley's teachings to the data compression of Bristol to provide for compression a data stream for transmission, display or storage **(column 1, lines 9-10 of Bristol)**.

v. The ordinary skilled person would have been motivated to:

(1) include the work of Barnsley and Boothroyd in terms of chaotic attractors (strange attractors) in which the attractor has almost periodic orbits **(page 22, first Column last complete paragraph and figure 2)**. Note the choice of discussing chaotic attractors in terms of their orbits are in terms of fractal geometry (as opposed to Euclidian) is a matter of convenience than substance. Barnsley is teaching compression of image files in which a geometric approach is in order whereas audio files can be discussed in terms of specific orbits of the attractor. With the use of the word periodic orbit in the phase space representation of the chaotic attractor we can move to the more traditional use of the term waveforms in the time domain.

(2) generate the best fit line segment of all data samples of the data stream received by the computer since the last segment end condition thereby compressing segments of the data stream **(column 4, lines 8-11 of Bristol)**.

b. Referring to claim 2:

i. Barnsley further teaches:

(1) the steps of removing from the weighted sum of the selected basic waveforms any selected basis waveforms not deemed necessary to approximate sufficiently well the image file and of removing the corresponding stored initialized codes **[i.e., accordingly, it is an object of Barnsley's invention to develop image compression methods and apparatus whose input is a data string, corresponding to a two-dimensional array of numerical attributes of a digitized picture, and whose output is a shorter string from which the original can be regenerate exactly or approximately (column 9, lines 17-23). The method of Barnsley's invention also possesses a remarkable stability property, small magnitude errors in compression codes lead to small error in the corresponding decoded image. This feature is not shared to a significant extend by any other exact image compression algorithm (column 9, lines 8-15)]**.

c. Referring to claim 3:

i. Barnsley further teaches:

(1) the step of identifying trends over sections of compressed image file and replacing the stored weighting factors for the sections of compressed image file by a suitable function [i.e. **Barnsley teaches the use of polynomial (function) to approximate recurring image elements in image compression (column 21, lines 34-36)**].

ii. However, Barnsley silent upon its use for image file compression, Boothroyd teaches:

(1) these principles through self-similarity may be applied to image data files (**see page 22, the discussion of the work of Mackenzie and Sandler in Boothroyd's Chaos systems**).

iii. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to:

(1) have applied Barnsley's teachings to the image files of Boothroyd to provide for compression in audio files as well as image files.

iv. The ordinary skilled person would have been motivated to:

(1) combine the teachings because it would have given rises to compressed image files almost indistinguishable from the original.

d. Referring to claim 4:

i. This claim has limitations that is similar to those of claim 3, thus it is rejected with the same rationale applied against claim 3 above.

e. Referring to claims 5, 8, 11-22:

i. These claims have limitations that is similar to those of claim 1, thus they are rejected with the same rationale applied against claim 1 above.

f. Referring to claim 6:

i. This claim has limitations that is similar to those of claim 2, thus it is rejected with the same rationale applied against claim 2 above.

g. Referring to claim 7:

i. This claim has limitations that is similar to those of claim 3, thus it is rejected with the same rationale applied against claim 3 above.

h. Referring to claim 9:

i. Barnsley further teaches:

(1) choosing a compressed image file; stripping stored initialization codes out of the compressed image file and applying the stored initialization codes to a chaotic system substantially the same as the chaotic system used in producing the compressed image file to produce the corresponding basic waveforms; stripping the stored frequency information out of the compressed image file and using the stored frequency information to transfer the basic waveform to the proper frequency range; and combining the basic waveforms according to the stored weighting factors to produce a detrended image slice; stripping the trend line information out of the compressed image file and using the trend line information to regenerate a trend line to add to the detrended image slice to produce an approximation of an original image slice [i.e., these limitations are similar to those of claim 1, thus they are rejected with the same rationale applied against claim 1 above. Furthermore, it is another object of Barnsley's invention to provide a parallel image processor for carrying out a random iteration method and a deterministic iteration method of image decompression based on iterated function systems (column 10, lines 12-19). In addition, it should be understood and appreciated that small changes in the parameter values or IFS codes yield only small changes in the resultant expanded or decompressed image (column 19, lines 26-29). Lastly, It should be mentioned at this point in the discussion of FIG. 9 that the method for obtaining an optimum set of IFS codes is itself an iterative process. Accordingly, the preferred method of obtaining such an optimum set of IFS codes comprises taking the IFS codes representing the original input image and decoding them to form an approximation of an image, and adjusting the IFS codes until the approximate image is sufficiently close to the original input image. Thus, the preferred embodiment of an image compression system 10 includes a decoder 20, which is described in greater detail in connection with FIGS. 10 and 11. The decoder 20 is



also known as an "iterated function system image synthesizer" or IFSIS, because it is useful to produce images in response to being provided numbers which represent IFS codes. In fact, the IFSIS decoder 20 will produce images even if it is provided meaningless numbers as inputs; of course, its principal utility is to produce decoded images in response to being provided IFS codes which were obtained by compressing an input image (column 20, lines 17-67 through column 21, lines 1-4)].

i. Referring to claim 10:

i. This claim has limitations that is similar to those of claim 9, thus it is rejected with the same rationale applied against claim 9 above.

j. Referring to claims 23 -32:

i. These claims have limitations that is similar to those of claims 1 and 9, thus they are rejected with the same rationale applied against claims 1 and 9 above.

### **Conclusion**

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Barnsley et al (US 5, 347, 600) discloses digital image data is automatically processed by dividing stored image data into domain blocks and range blocks. The range blocks are subjected to processes such as a shrinking process to obtain mapped range blocks (see abstract).

b. Fleming-Dahl (US 6, 744, 893 B1) discloses a chaotic receiver estimation engine and method of use. The estimation engine synchronizes and recovers data and performs its decision and tracking processes by mapping probability calculation results onto chaotic dynamics via a strange attractor geometrical approximation (see abstract).

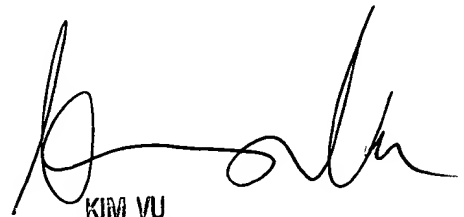
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhnga (Tanya) Truong whose telephone number is 571-272-3858.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Vu can be reached at 571-272-3859. The fax and phone numbers for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2100.

TBT

November 7, 2004

A handwritten signature in black ink, appearing to read 'Kim Vu', is written over the printed name.

KIM VU  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2100